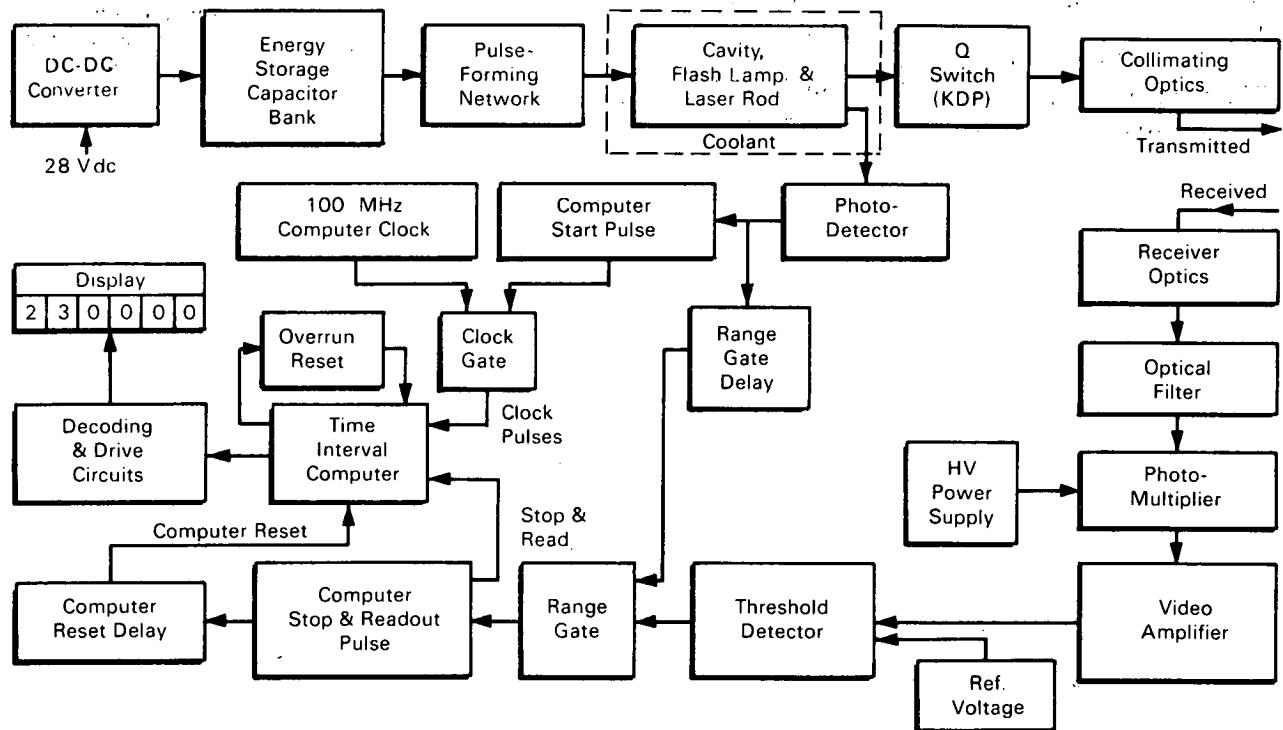


NASA TECH BRIEF



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Laser Altimeter



Block Diagram of Typical Laser Altimeter

The problem:

To design a laser altimeter for use in orbital photogrammetry and geodesy. The altimeter, when used in conjunction with a metric camera system, helps provide a highly accurate range measurement to an extremely small area.

The solution:

A ruby laser operating at 6943\AA at the heart of an electronic ranging system.

How it's done:

A review of developed laser systems indicated that the best transmission sources for the specified mission operate at three different wavelengths. Nd-doped lasers operate at 1.06μ ; ruby lasers operate at 6943\AA ; and frequency-doubled Nd-doped lasers operate at 5300\AA . An analysis of these lasers indicated that, at specified altitudes, the ruby laser best performed the altimetry function, both over the ocean and over land.

(continued overleaf)

A block diagram of a typical laser altimeter is shown in the figure. The input voltage level (28 V dc) is raised to 2000 V dc by the dc to dc converter, and coupled to an energy-storage capacitor. The energy is discharged through a pulse-forming network to fire the flash lamp and energize the laser. The laser beam is collimated to approximately 0.1 milliradian, and transmitted. A portion of the beam is used to energize a photodetector, which triggers the 100 MHz clock and sends a pulse start to the time interval computer.

The transmitted signal reaches the target, is reflected, and the returning signal is received by collecting optics with a 1-foot aperture and a 6×10^{-8} steradian field of view. The received signal is passed through a narrow-bandpass filter (20 Å bandwidth, centered on the laser wavelength) into a photomultiplier. After amplification, the photomultiplier output pulse is sensed by a threshold detector, which sends a stop pulse to the computer.

The range is computed from the number of clock pulses received by the computer between start and

stop pulses, on a basis of 1.5 m of range per pulse, and is displayed on a decimal scaler, from which it may be read directly, or photographically recorded.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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Huntsville, Alabama 35812
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No patent action is contemplated by NASA.

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